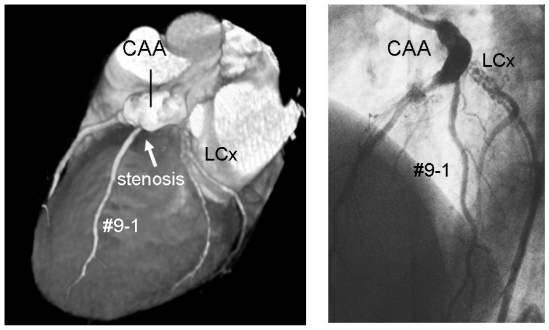
nary segments were significantly diseased. The sensitivity, specificity, positive and negative predictive value to identify ≥50% obstructed segments was 92% (216/234, 95% CI:88-95), 95% (1092/1150, 95% CI:93-96), 79% (216/274, 95% CI:73-88) and 98% (1092/1110, 95% CI:97-99), respectively. All occluded segments were detected.Conclusion: The diagnostic performance of MSCT coronary angiography combined with heart rate control to detect significant stenosis in the entire coronary tree is high.

1075-162 Detection of Coronary Artery Aneurysms, Stenoses and Occlusions by Means of Multislice Spiral Computed Tomography in Adolescents and Young Adults With Kawasaki Disease

Hiroshi Kanamaru, Yuichi Sato, Fumio Inoue, Takako Imazeki, Naoya Matsumoto, Masahiko Kato, Takashi Miyamoto, Kensuke Karasawa, Mamoru Ayusawa, Naokata Sumitomo, Kensuke Harada, Katsuo Kanmatsuse, Nihon University School of Medicine, Tokyo, Japan

We evaluated the diagnostic accuracy of multislice spiral computed tomography (MSCT) to detect coronary artery aneurysms (CAAs), stenoses and occlusions in 10 adolescents and young adults with Kawasaki disease. **Methods:** Patients consisted of 7 men and 3 women with the age 18±5 years old (range; 13-26 years old). Coronary artery bypass surgery had been performed in 2 patients (2 arteries). Coronary angiography had been performed within 3 years in all the patients. MSCT was performed using a Siemens SOMATOM Volume Zoom. Patients were premedicated with Metoprolol (20-60mg). The scan was performed with collimation 1.0mm and the gantry rotation time 500ms. In all patients, the single-phase algorithm with 250ms temporal resolution was applied. The retrospectively ECG-gated image reconstruction was performed with the end of the reconstruciton window (250ms) positioned at the peak of the P waves on ECG in order to avoid cardiac motion artifacts. **Results:** MSCT detected all the CAAs (n=12) and complete occlusions (n=6).The sensitivity and specificity to detect significant coronary stenoses were 100%, and 94%, respectively. **Conclusion:** MSCT has a potential to become a standard diagnostic tool in adolescents and young adults with Kawasaki disease.**Figure:** A 20-year-old man with Kawasaki disease. A giant CAA and stenosis at the first diagonal artery (#9-1) are demonstrated on both MSCT and angiogram. In addition, the left circumflex artery (LCx) shows multi-layered 'braid-like' appearance.



1075-163 Multislice Gated Cardiac Computed Tomography Accurately Estimates Left Ventricular Volumes and Ejection Fraction

Bénédicte Belge, Alain Vlassenbroeck, Emmanuel Coche, Mani Vembar, Les Ciancibello, Peter C. Johnson, Bernard VanBeers, Jean-Louis J. Vanoverschelde, Bernhard L. Gerber, Cliniques Universitaires St.Luc, Brussels, Belgium, Philips Medical Systems, Cleveland, OH

Background: Multislice computed tomography (MSCT) is currently used for non-invasive coronary imaging. Image reconstruction at different times during the cardiac cycle also offers the opportunity to assess left ventricular (LV) volumes and ejection fraction (EF). However, the accuracy of these measurements has not yet been compared with other techniques. Therefore the aim of this study was to compare LV volumes and ejection fraction obtained using MSCT against those obtained by cine MRI.

Methods: Fourteen patients with coronary artery disease (12 M, 59±13 years) underwent both MSCT and cine MRI on the same day. MSCT was acquired using a 16 slice system (IDT, Philips Medical Systems, Cleveland OH) after injection of 120 cc iodated contrast agent. Retrospectively ECG gated cardiac images were acquired using a table pitch of 0.24 during a 20 second breathhold and reconstructed every 12.5% of the cardiac phase. MRI was performed using a 1.5 T (Philips Intera CV, Best, the Netherlands) system. Ten serial short axis images of 8 mm width and 2 mm spacing were obtained in 20 cine phases using a balanced fast field echo VCG gated sequence with SENSE during serial breathholds. Short-axis MSCT and MRI images were analyzed semi-automatically using dedicated softwares (MX-view, Easy-vision, Philips). LV end-diastolic (EDV) and end-systolic (ESV) volumes as well as LVEF were calculated using the Simpson's method and compared among both techniques.

Results: Mean heart rate during cardiac MSCT was 68±12 bpm (range 50-102 bpm). LVEDV and LVESV assessed by MSCT (141±60 ml and 77±60 ml) were not significantly different from those calculated by MRI (156±94 ml and 97±86 ml respectively, both p=N.S. vs. MSCT). Consequently, the EFs estimated by MSCT and MRI were similar (51±22 vs 52±24 %, p=N.S.). MSCT and MRI measurements of LVEDV, LVESV, and EF were strongly correlated (r= 0.84, 0.90, 0.98, respectively).

Conclusions:

Retrospectively gated MSCT accurately estimates LV volumes and ejection fraction. Since assessment of cardiac function with MSCT can easily be obtained at the time of coronary imaging, this places MSCT in a strong position for the one-stop shop assessment of coronary patients.

1075-164 It Is More Than Calcium? Characterization of Coronary Segments via Computer-Assisted Electron Beam Computed Tomography Image Analysis

Jose G. Diez, Jonathan A. Aliota, Manoj Rawal, Paolo Raggi, Tulane University, New Orleans, LA

Background: Imaging coronary arteries with electron beam computerized tomography (EBCT) is an available technique being used to detect coronary plaque calcification and burden of coronary artery disease (CAD). Currently, EBCT software neglects analysis of non-calcified arteries. We evaluated the feasibility of using pixel density via computer assisted image analysis to provide a quantifiable characterization of non-calcific EBCT imaged coronaries. Image analysis may identify pixel density changes within non-calcified arterial segments in subjects with CAD.

Methods: Evaluation of non-calcified proximal coronary segments obtained from EBCT recordings. Calibration used bone signals as high density and air to low, providing a pixel density range from 255 to 0 units. Imaged arteries were allocated in 4 groups: Low score + no cardiac risk factors, low score + 2 or more cardiac risk factors, high score + known CAD + segment within non-calcified artery, high score + known CAD + skip lesions within a calcified vessel. Image analysis calculated absolute minimum, maximum and mean arterial pixel densities.

Results: Arterial pixel densities, as well as absolute minimum and maximum pixel densities correlated to EBCT mean calcium score, and known CAD. Table 1.

Conclusion: Characterization of non-calcific coronary segments via assisted EBCT image analysis is a feasible method that allows quantification of pixel densities. Increasing pixel density within coronaries correlates with EBCT score and known CAD.

Table 1.Pixel densities obtained by image analysis compared to mean calcium score calculated by EBCT

	Mean Calcium Score (EBCT)	Mean Measured Area (Computer)	Mean Minimum Pixel Density (Computer)	Mean Arterial Pixel Density (Computer)	Mean Maximum Pixel Density (Computer)
No Cardiac Risk Factors (n=15)	0	1393.82 mm^2	58.25	109.61	151.00
>=2 Cardiac Risk Factors (n=13)	0	1044.54 mm^2	60.00	112.68	158.86
Known CAD (n=30)	81.5	533.59 mm^2	79.00	131.10	184.06
Skip Lesions (n=15)	86.9	536.44 mm^2	71.2	138.178	207.47

ORAL CONTRIBUTIONS

802 Stress Echocardiography: Beyond Traditional Uses

Monday, March 08, 2004, 9:15 a.m.-10:30 a.m.
Morial Convention Center, Hall D-1

9:15 a.m.

802-1 Relationship Between Contractile Reserve and Diastolic Function in Hibernating Myocardium

Erberto Carluccio, Paolo Biagioli, Mariagrazia Sardone, Federico Marroni, Gianfranco Alunni, Adriano Murrone, Gabriella Vincenti, Ketty Savino, Maurizio Bentivoglio, Temistocle Ragni, Claudio Giombolini, Giuseppe Ambrosio, Silvestrini Hospital, Perugia, Italy

Background: In hibernating myocardium, degree of fibrosis is known to dictate extent of contractile response to dobutamine. Since increased fibrosis may also cause increased stiffness and impaired left ventricular (LV) diastolic filling, we evaluated whether there is a relationship between contractile reserve and diastolic filling in hibernating myocardium.

Methods: In 31 patients with chronic ischemic LV dysfunction (age 65±9 yrs; 26 males), evidence of viability (by dobutamine echocardiography), and no LV scar, 2D- and Doppler echocardiography were performed at baseline and 6±3 months after revascularization. Based on transmitral flow pattern at rest, patients were divided into two groups: restrictive filling pattern (RF, n=12) and non-restrictive filling (NRF, n=19).

Results: At baseline, RF and NRF groups did not differ with respect to average number

of dysfunctional segments/patient (11.4±3.0 vs 11.0±3.0), global wall motion score index (WMSI: 2.37±0.36 vs 2.12±0.42), and ejection fraction (EF: 29±9% vs 35±8% p=NS). However, in patients with RF pattern the number of segments/patient showing contractile response to dobutamine (3.50±2.43 vs 6.63±2.59; p<0.01) and the percent contractile reserve (31±22% vs 65±22%; p<0.0001) were lower compared to NRF patients, and WMSI at peak dobutamine infusion higher (1.93±0.24 vs 1.60±0.36; p<0.05), indicating reduced contractile reserve in patients with impaired diastolic filling. Across all patients there was also a positive correlation between the number of segments showing contractile reserve and both isovolumic relaxation time (r=0.64, p<0.0001), and deceleration time of peak E-velocity (r=0.56, p<0.001). After revascularization, LVEF increased by 11±9% in patients with NRF but by only 4±3% in patients with RF pattern (p<0.05). Also, in patients with NRF compared to RF pattern, function recovered in 4.22±4.0 segments vs 1.75±3.0, and WMSI improved by 0.44±0.42 vs by 0.33±0.40 (p<0.05), respectively.
Conclusions: In patients with hibernating myocardium, impaired diastolic filling is associated with reduced contractile reserve; restrictive filling pattern may also predict poor recovery of function after revascularization.

9:30 a.m.

802-2 **Dobutamine Versus Levosimendan Stress Echocardiography for the Prediction of Recovery of Left Ventricular Dyssynergies After Revascularization**

Georgios P. Pavlakis, Konstantina P. Bouki, Theodoros Kakavas, Kiriakos Poulopoulos, Athanasios Kotsakis, Valerios Foulidis, Takis Xidas, Evangelos Papasteriadis, Nikea General Hospital, Piraeus, Greece

Background: Levosimendan is a new calcium-sensitizer agent with inotropic and diuretic properties. Although it is used as an inotropic agent in decompensated heart failure showing comparable efficacy to the other inotropic drugs, it has not been used in stress echocardiography yet. The purpose of our study was to compare the accuracy of levosimendan (LSE) and dobutamine stress echocardiography (DSE) for the prediction of recovery of left ventricular (LV) dyssynergies after revascularization.
Methods: Twenty eight patients with LV dysfunction due to previous myocardial infarction scheduled for revascularisation (18 coronary angioplasty and 10 bypass surgery) underwent low-dose DSE (5-10μgr/kgr/min) and LSE. Levosimendan was infused at least 1 hour after dobutamine infusion, at 2 doses of 12 and 24μgr/kgr, over a 5 minutes period each. LV wall motion score was assessed using a 16-segment model. Myocardial viability was detected if improvement of ≥1 grade of regional wall motion score in at least two contiguous segments was noted, during either dobutamine or levosimendan infusion. All patients also underwent resting echocardiography within 6 months after successful revascularization.
Results: No major adverse events occurred during levosimendan or dobutamine administration. Of the 448 segments studied, 212 (47%) were dyssynergic at rest. Dobutamine infusion resulted in augmented contraction in 98/212 (46%) abnormal segments while 88 (90%) of them showed functional improvement after revascularization. During LSE 110/220 (52%) dysfunctional segments improved and 100 (91%) of them recovered function after revascularization. Analysis of results showed a significantly lower sensitivity of DSE compared to LSE (73% Versus 94% respectively, p<0.01) but a similar specificity (88% Versus 90% respectively, p=ns) for the prediction of the recovery of LV dyssynergies after revascularization.
Conclusions: Levosimendan can be used safely in stress echocardiography. Futhermore, LSE seems to predict postrevascularization recovery of LV dysfunction with higher accuracy than DSE.

9:45 a.m.

802-3 **Comparative Long-Term Prognostic Value of Dobutamine Stress Echocardiography Versus Dobutamine Stress Myocardial Perfusion SPECT**

Arend F.L. Schinkel, Jeroen J. Bax, Abdou Elhendy, Don Poldermans, Erasmus MC, Rotterdam, The Netherlands

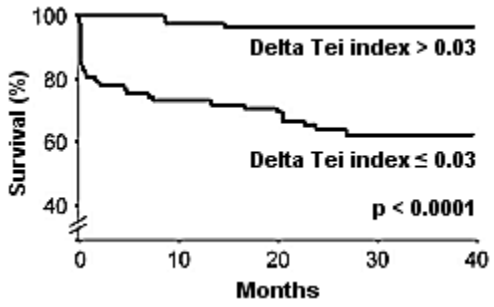
Objectives: The purpose of this study was to compare the long-term prognostic value of dobutamine stress echocardiography and dobutamine stress single photon emission computed tomography (SPECT).
Background: Dobutamine stress echocardiography and dobutamine stress SPECT are clinically useful methods for the detection of coronary artery disease. The comparative longterm prognostic value of these imaging modalities is not clear.
Methods: A total of 354 consecutive patients underwent simultaneous dobutamine stress 99mTc-sestamibi SPECT and dobutamine stress echocardiography. Follow-up was successful in 351 (99.2%) patients. Fifty patients underwent early (<60 days) revascularization and were excluded; the analysis is based on 301 patients.
Results: Abnormal perfusion was detected in 198 (66%) patients, and 182 (60%) had an abnormal stress echocardiography; the agreement was 82% (kappa=0.62). During 7.3 {plus minus} 2.8 years follow-up, 100 (33%) deaths occurred of which 43 (43%) were due to cardiac causes. Nonfatal infarction occurred in 23 (8%) patients and 29 (10%) underwent late revascularization. Annual event rates for cardiac death, or all cardiac events were respectively, 0.7%, and 3.6% after a normal scan, and 2.6%, and 6.5% after an abnormal scan, P<0.0001. For stress echocardiography, annual event rates for cardiac death, or all cardiac events were, respectively, 0.6%, and 3.3% after a normal test, and 2.8%, and 6.9% after an abnormal test, P<0.0001. In multivariable Cox models, 99mTc-sestamibi SPECT and stress echocardiography were the strongest predictors of cardiac death (OR 2.4, CI 1.1-6.5 and OR 3.3, CI 1.2-8.7, respectively) and all cardiac events (OR 2.3 CI 1.1-4.9 and OR 3.4 CI 1.7-6.8). Both modalities had a similar incremental prognostic value over clinical variables (SPECT vs. echocardiography: global chi-square 33.2 vs. 36.0, P=NS).
Conclusions: Dobutamine stress 99mTc-sestamibi SPECT as well as dobutamine stress echocardiography provide comparable, powerful, long-term prognostic information over clinical data.

10:00 a.m.

802-4 **The Doppler Tei Index During Dobutamine Stress Echocardiography: A Powerful Predictor of Mortality After Acute Myocardial Infarction**

Betina Norager, Mirza Husic, Jacob Moller, Kenneth Egstrup, Svendborg Hospital, Svendborg, Denmark, Odense University Hospital, Odense, Denmark

Background: Myocardial viability can be detected by systolic wall motion analyses during dobutamine stress echocardiography (DSE). However, not only systolic but also diastolic left ventricular function has a potential of improvement after acute myocardial infarction (AMI). Therefore, we hypothesized that the Doppler Tei index of combined systolic and diastolic performance (sum of isovolumic relaxation and contraction times divided by ejection time) obtained during DSE could provide prognostic information beyond conventional systolic wall motion analyses.
Methods: In 162 consecutive patients with first myocardial infarction DSE (10 μg/kg/min) was performed 16 ± 6 hours after hospital admission. Delta Tei index was calculated as the change in Tei index from rest to DSE.
Results: During follow-up of 25 ± 11 months, 33 patients (20 %) died. Delta Tei index was significantly higher in survivors than in patients dying (0.05 ± 0.09 versus -0.08 ± 0.11, p < 0.0001). Mortality rate was significantly lower in patients with delta Tei index above the median (0.03), p < 0.0001 (Figure). In a multivariate Cox regression model, delta Tei index (chi-square = 8.1, p = 0.004) added prognostic information above and beyond age, Killip class II ≥ on admission, ejection fraction, mitral deceleration time ≤ 140 ms, and infarct zone viability.
Conclusions: Tei index obtained during DSE is a powerful predictor of mortality after AMI and provides prognostic information incremental to conventional stress echocardiographic data.



10:15 a.m.

802-5 **Long-Term Prognostic Value of Pacing Stress Echocardiography Compared With Dipyridamole Tl^{201} Tomography in Patients With Permanent Pacemaker and Known or Suspected Coronary Artery Disease**

Sarah Shimoni, Sorel Goland, Shay Livshitz, Gera Gendelman, Avraham Caspi, Menashe Epstein, Kaplan Medical Center, Rehovot, Israel

Background: Myocardial ischemia is difficult to assess by noninvasive methods in patients (pts) with permanent pacemaker (PP).Recently, pacing stress echocardiography (PSE) using external programming of the PP has been used successfully for detection of coronary artery disease (CAD). However, the prognostic value of this method is not well defined.
Methods: We compared the long-term prognosis of PSE and radionuclide tomography (SPECT) in 46 pts (mean age 75 yr) with PP and known or suspected CAD. All pts underwent PSE with increasing pacing rate up to 100% of age predicted maximal heart rate or upper limit of pacemaker rate. Forty-one pts also underwent dipyridamole SPECT. Pts were followed for a median of 570 days (range, 60-870). Event-free survival was estimated using Kaplan-Meyer analysis.
Results: PSE was negative in 17 and positive in 29 pts. SPECT was negative in 8 and positive in 33 pts. During follow up there were 15 cardiac events (death, myocardial infarction and need for revascularization). The projected two-year event free survival was 81±13% in pts with normal PSE and 24%±18% when the PSE was abnormal (p=0.03). Predicted two-year event free survival was 41±19% and 88±11% in pts with abnormal and normal SPECT, respectively (p=NS).
Conclusions: PSE allows effective risk stratification in pts with PP known or suspected to have coronary artery disease. The prognostic value of PSE is better than SPECT in this population. PSE merits further study in a larger prospective comparative study.